THE ECONOMICS OF PRODUCTION AND MARKETING OF GREENHOUSE CROPS IN ALBERTA 1982-83

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THE ECONOMICS OF PRODUCTION AND MARKETING OF GREENHOUSE CROPS IN ALBERTA, 1982-83

BY

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July, 1984

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G. NABI CHAUDHARY

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SECTION I

INTRODUCTION

In the fall of 1982, the Protected Crops Advisory Committee requested that the Production Economics Branch undertake a study of the greenhouse industry and provide production costs and returns information by greenhouse crops. The greenhouse industry in the province has gone through several changes which required some adjustments therefore the need was felt to develop some information based on the current conditions so that the industry could make adjustments accordingly. The costs of natural gas and greenhouse supplies became major concerns in 1982 and 1983. The specific request for another study of the industry was made primarily to update some of information compiled for the 1978-79 and 1979-80 greenhouse crop years and to evaluate the financial viability of the industry in the province. Because of the changing economic conditions, the previously compiled information on the greenhouse industry became more or less obsolete. Significant increases in natural gas costs for heating greenhouses and the price of greenhouse supplies created some economic difficulties for the greenhouse operations in the province. Realizing these difficulties the provincial government introduced an energy rebate program for the primary agriculture producer whereby greenhouse operators received a maximum assistance of up to $4850 to supplement heating expenses.(1)

As mentioned above, a survey of the greenhouse industry was undertaken for the 1978-79 and 1979-80 crop years to provide production costs and returns information for selected greenhouse crops and by size of greenhouses.

Two reports, one each based on the respective crop year were published and have been used as guidelines for greenhouse investment decisions. The reports highlighted the problems in production, marketing, transportation, availability of finance and other concerns of the greenhouse operators in Alberta.

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(1) The Primary Producers' Energy Rebate Program was introduced in October 1982. Under this program a greenhouse operator could receive a maximum assistance of $4850 towards natural gas heating costs.

This report provides the most current information on greenhouse production costs and returns by major greenhouse crops and by size of greenhouses for the 1982-83 crop year. At the beginning of this undertaking it was decided that the study would be carried over two years in order to obtain a better assessment of the industry.

Objectives of the Study

The following were the major objectives of the study:

1. Determination of the structure of the greenhouse industry in Alberta;
2. Estimation of greenhouse production costs and returns by major crops;
3. Identification of the main factors influencing production and marketing of greenhouse crops in Alberta; and
4. Identification of major problems experienced by greenhouse producers in Alberta.

The Study Sample

The questionnaire prepared for the previous study years (1978-79 and 1979-80) was further modified to simplify data entry. The questionnaire was used to obtain the required information from a selected sample of greenhouse operators accross the province.

Thirty-three (33) greenhouse operators were selected with the assistance of the Extension Horticulturist at Alberta Horiculture Research Centre, Brooks, in order to obtain production costs and returns information for the 1982-83 crop year. Out of 33 only 27 greenhouse operations were surveyed. Twenty-five greenhouse operators were able to provide complete records of their business and data from two greenhouses was not adequate for analytical purposes. Two (2) greenhouses were shut-down because of financial problems, and the other four operators were unable to provide any information on their operations. Therefore, in this report data from 25 greenhouse operators were used to meet the objectives of the study.

Method of Analysis

The technique used to analyze the data was "SPSS" (Statistical Package for the Social Sciences). SPSS is an integrated system of computer programs for the analysis of social science data. It provides the user with a comprehensive set of procedures for data transformation and file manipulation, and it offers the researcher a large number of statistical routines commonly used in the social sciences.[1]

After the completion of the questionnaire, data were reviewed to make sure that no information was missing from the questionnaire. Data were key-punched for analytical purposes.

Each greenhouse operation was analyzed separately and the participant received a detailed personalized report of his/her greenhouse. The study was divided into two groups i.e. by the type of crop produced and by the size of the operation. This breakdown provided representative cost and return estimates by type of crops produced in the greenhouses and what size of greenhouse operation was more profitable.

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(1) Norman, H. Nie; Dale H. Bent and C. Hadlai Hull, Statistical Package For The Social Sciences, McGraw-Hill Book Company, New York, April 1971, pp. 1-3.

SECTION II

GREENHOUSE OPERATIONS IN ALBERTA

Although greenhouses in Alberta are scattered throughout the province, more than two-thirds of these operations are located in the south and south-central regions. The area around Medicine Hat is called the "greenhouse belt" of Alberta because of the Red Hat Co-op (a producer organization responsible for marketing cucumbers) and large number of greenhouses in this area. Most of the greenhouses are located in cities and towns because of easy access to labour, marketing facilities, utilities and services necessary for the greenhouse operation. During the last few years, a few new greenhouses have been built at some distance from the major population centres due to very high land prices and taxes. A few greenhouses are located on farms where, because they are part of the farm business, they are relatively smaller in size when compared to greenhouses situated in cities and towns.

According to the 1981 Canada Census, there were 379 greenhouse operations in Alberta with a total area of 388,625 square metres (4,183,125 square feet) or 38.8 hectares (96 acres). The number of greenhouses reported in the census is considerably higher than the estimates in the past. It could be concluded from the data available through the census that there is a large number of hobby or backyard greenhouses in the province. Table 1 provides information on greenhouses classified by total capital value in 1981. Eighty (80) or 21 per cent of the greenhouses reported capital value of the facilities ranging from $5,000 to $99,999; 225 (55 per cent) reported a capital value of $100,000 to $499,999 in 1981. Seventy-four (20 per cent) of the greenhouses reported a capital value of $500,000 and over (Table 1).

Table 2 presents a classification of greenhouses by the value of products sold. About 56 per cent (214) of the greenhouses in Alberta reported product sales under $25,000 in 1981 of which 26 per cent (100) of the greenhouse operations reported sales under $5,000. This group can very well be classified as hobby or backyard greenhouses.

TABLE 1

GREENHOUSES CLASSIFIED BY TOTAL CAPITAL VALUE OF FARM OPERATION

Item	Unit	Total Farms	Total Capital Value: Under 99,999	$100,000 199,999	$200,000 499,999	$500,000 and over
Greenhouse	Sq. Ft.	4 183 125	475 012	546 939	1 095 190	2 065 984
area	m^2	388 625	44 129	50 812	101 746	191 936
Farms Reporting	No.	379	80	97	128	74

Source: Canada Census, 1981

TABLE 2

GREENHOUSES CLASSIFIED BY SALES

Value of Greenhouse Products Sold

Item	Unit	Farms	$250,000 and over	$100,000 249,999	$50,000 99,999	Under 49,999
Greenhouses	Sq. Ft.	4,183,125	1,698,282	621,512	741,873	1,121,458
area	m^2	388,625	157,776	57,740	68,922	104 189
Farms Reporting	No.	379	22	27	56	274

Source: Canada Census, 1981

Thirty-one per cent (116) of the greenhouses reported product sales between $25,000 and $99,999 in 1981, and the remaining 13 per cent (49) reported product sales of over $100,000. Information presented in Table 2 shows that there are about 165 commercial greenhouses in the province which are actively involved in the production and marketing of crops grown in a controlled environment.

Besides census taking every five years, Statistics Canada undertakes a survey of the greenhouse industry every year to identify the number of commercial operations, crops grown and the total output of crops produced in a controlled environment.

In 1979, all greenhouse operations in Alberta were contacted by Statistics Canada and only 97 firms reported on their operations. This number increased to 105 in 1980 reporting a greenhouse area of 2.826 million square feet which is just more than half of the greenhouse area reported in the 1981 census. In 1981, the area under greenhouses decreased to 2.385 million square feet primarily because of the decrease in the number of firms (97) reporting on their operations. In 1982, although the number of firms reporting on their operations further decreased to 92, the overall greenhouse area reported by these firms increased to 2.680 million square feet.

A survey undertaken by Statistics Canada does not provide a complete picture of the greenhouse industry in Alberta because a large number of growers fail to provide the required information. Greenhouse operators should make an effort to complete the one-page questionnaire as it is to their advantage to know the size of their industry and the types of crops produced. If such information were available, it would assist in planning crops which can be marketed easily in order to maximize returns.

The Statistics Canada survey of the greenhouse industry reported average area per firm (Table 3), both under glass and plastic, at 24,335 square feet in 1979. It increased to 26,916 square feet per firm in 1980, but decreased to 24,589 square feet in 1981. In 1982, average area per firm was 29,132 square feet, a considerable increase over previous years. This increase in average area per firm can be attributed to the large greenhouses reporting on their operations when compared to previous years. In 1982, the number of firms reporting on their operations was

TABLE 3 GREENHOUSE AREA AND SALES OF VEGETABLES AND ORNAMENTAL FLOWERS IN ALBERTA

Area of Glass & Plastic	1979	1980	1981	1982
No. Reporting	97	105	97	92
Total Area				
Sq. Ft.	2,360,462	2,826,145	2,385,114	2,680,166
m^2	219,294	262,557	221,584	248,995
Av/Firm				
Sq. Ft.	24,335	26,916	24,589	29,132
m^2	2,261	2,501	2,284	2,706
A. GLASS				
No. Reporting	58	57	51	48
Area Sq. Ft.	1,541,585	1,660,815	1,109,696	1,401,820
Area m^2	143,218	154,294	103,094	130,233
Av/Firm Sq. Ft.	26,579	29,137	21,759	29,205
m^2	2,469	2,707	2,021	2,713
B. PLASTIC				
No. Reporting	64	74	69	66
Area Sq. Ft.	818,877	1,155,330	1,275,418	1,278,346
Area m^2	76,076	108,263	118,490	118,762
Av/Firm Sq. Ft.	12,795	15,748	18,484	19,369
m^2	1,189	1,463	1,717	1,799
C. SALES				
No. Reporting	97	105	97	92
Total Sales ($)	11,422,395	15,666,039	17,768,633	19,864,213
Av/Firm ($)	117,757	149,200	183,182	215,915
Sales/Sq. Ft.	4.84	5.54	7.45	7.41
Sales/m^2	52.09	59.67	80.19	79.78

Source: Statistics Canada,
GREENHOUSE INDUSTRY, Cat. No. 22-202, Annual 1979-82.

down to 92, the lowest number of firms reporting during the last four years.

Gross sales of greenhouse produce as per the Statistics Canada survey (Table 3) amounted to $11.4 million in 1979 which increased to $15.7 million in 1980. Average sales per firm were $117,757 in 1979 and $149,200 in 1980. Total sales of greenhouse produce increased to $17.8 million in 1981 and to $19.9 million in 1982. Similarly average sales per firm increased to $183,182 and $215,915 in 1981 and 1982, respectively. Average sales per square foot were $4.84 in 1979, increasing to $5.54 in 1980, $7.45 in 1981 and decreasing to $7.41 in 1982. Details regarding total area under glass and plastic, and total sales of vegetables, bedding plants and ornamental flowers in Alberta for the years 1979 to 1982 are presented in Table 3.

The size of the greenhouses surveyed for the 1982-83 study ranged from 9,728 to 220,00 square feet (904 to 20 438 m^2). Distribution of the greenhouse area under glass, fiberglass and plastic is presented in Table 4. Group I represents north and north central Alberta (regions 3, 4, 5 and 6), and Group II represents south and south central Alberta (regions 1 and 2). For the 1982-83 study, 33 greenhouse operations were selected and only 25 were able to provide the required information. As the survey will be carried into the next crop year i.e. 1983-84, attempts will be made to expand the sample to about 40 participants in order to obtain more detailed information on the greenhouse industry in Alberta.

Figure 1 shows the distribution of greenhouses in Alberta. Growth in the greenhouse industry has remained almost stagnant during the last 4-6 years. Although some new greenhouses have been built and additions have been made to the existing facilities, there have also been greenhouse closures which have offset the net growth of the industry. In Group I, total area under glass was 70,700 square feet (6 568 m^2), about 17 per cent of the total greenhouse area surveyed in the north and north central regions. The greenhouse area under fiberglass and plastic amounted to 164,156 square feet (15 250 m^2) or 41 per cent and 168,716 square feet (15 674 m^2) or 42 per cent, respectively.

In Group II (south and south central regions), the distribution of the greenhouse area for the 17 study participants was somewhat different from that in Group I. About 52.9 per cent of the total area surveyed was

TABLE 4

GREENHOUSE AREA BY THE TYPE OF STRUCTURE FOR THE GREENHOUSE SURVEYED

			Greenhouse Area - - Square Feet and m²				
		No. of Greenhouses Surveyed	Glass	Fiber Glass	Plastic	Total	Average Per Grower
Group I[1]	square feet	10	70,700	164,156	168,716	403,572	40,357
	m²		6 568	15 250	15 674	37 492	3 749
Group II[2]	square feet	17	385,050	186,000	157,240	728,290	42,841
	m²		35 772	17 280	14 608	67 660	3 980
TOTAL[3]	square feet	27	455,750	350,156	325,956	1,131,862	41,921
	m²		42 340	32 530	30 282	105 152	3 894

(1) Group I represents north and north central regions (3, 4, 5 and 6).

(2) Group II represents south and south central regions (1 and 2).

(3) Data from 25 greenhouse operations were used to analyse costs and returns.

FIGURE 1

ALBERTA
AGRICULTURE
REGIONS

Group I includes regions
3, 4, 5 and 6.

Group II includes regions
1 and 2.

under glass compared to 17 per cent in Group I. Area under fiberglass and plastic was 25.5 per cent and 21.6 per cent, respectively. Area reported by the greenhouse operators in Group II was 385,050 square feet (35 772 m^2) under glass, 186,000 square feet (17 280 m^2) under fiberglass and 157,240 square feet (14 608 m^2) under double plastic.

Total area of the greenhouses surveyed for the 1982-83 greenhouse crop year was 1,131,862 square feet (105 152 m^2), of which 455,750 square feet (42 340 m^2) or 40.2 per cent was under glass, 350,156 square feet (32 530 m^2) or 31.6 per cent, under fiberglass and 325,956 square feet (30 282 m^2) or 28.8 per cent under plastic. Average area per grower for Group I study participants was 40,357 square feet (3 749 m^2) compared to 41, 841 square feet (3 980 m^2) for Group II. Average area for the entire study sample was 41,921 square feet (3 894 m^2). It is interesting to note that the southern part of the province has more glass structured greenhouses than the north and north central areas. Details regarding greenhouse area by the type of structure of the greenhouses surveyed for the 1982-83 crop year are presented in Table 4.

Physical Characteristics of Greenhouses

There are many types of greenhouses in Alberta ranging from small sash roof "lean-to" houses constructed of a wood-frame sash to the large modern steel frame houses with truss supported roofs. Most new houses are of steel, wood or masonry construction covered either with glass, fiberglass, double plastic, or a single layer of plastic. A 1982 survey by Statistics Canada reported that 92 commercial greenhouses in Alberta had just over 1.4 million square feet (130 232 m^2) or 52 per cent of the area under glass and fiberglass, and 1.3 million square feet (188 761 m^2) or 48 per cent of the area under plastic.

During the last 5-6 years a new concept known as "HYDROPONICS" has emerged in the Alberta greenhouse industry and at the present is being used in the production of tomatoes. Although this greenhouse crop production technique has been in use for quite sometime in the States, Eastern Canada and British Columbia, but it was not until 1978-79 that it

was introduced in Alberta.[1] At present there are about a dozen greenhouse operations in Alberta which are using the hydroponic method of producing greenhouse crops especially tomatoes. Several growers are evaluating the use of this technique for producing lettuce, and other greenhouse crops.

Major internal features of greenhouse systems in Alberta are as follows:

i) Temperature Control

A year-round greenhouse operation is heated with natural gas to maintain optimum temperatures for crops grown during winter months. Some vegetable producing greenhouses operate for 9 to 10 months of the year and close down during November and December. Almost all of the greenhouses in southern Alberta are heated by natural gas burners and when combined with stove pipes, these burners provide sufficient heating through natural air movement. Greenhouses in northern Alberta are equipped with natural gas boilers and hot water pipes for heating. All boiler heating systems have automatic temperature control devices.

In addition to heating systems, most greenhouses in Alberta are equipped with a pad and fan cooling system. The cooling system is essential if temperatures are to be lowered during the hot summer months.

ii) Watering System

The watering of ground beds is usually accomplished by the use of soaker hoses which run on each side parallel to the bed. Bench beds and potted plants are usually watered with the use of chapin tubes. Smaller operations may utilize water supply pipes along with garden hoses.

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(1) "HYDROPONICS" is a crop production technique in a controlled environment which replaces soil with a sterile growing medium and automatic watering/feeding system generally meaning faster growth, higher yields, less work, more precise control of watering and feeding, fewer diseases, a cleaner operation and better quality produce. On the negative side, initial installation costs are higher and a greater degree of technical skill is required to maximize results.

iii) Supplementary Lighting

Very few greenhouses have supplementary lighting. Those that do have lighting in the form of ordinary lamps, usually five to six feet apart. Supplementary lighting is mostly used for producing chrysanthemums.

Greenhouse Crops

Greenhouses in Alberta produce many kinds of flowers, chrysanthemums, roses and geraniums being the most common potted plants. Outdoor flowers such as petunias and marigolds are also produced in these greenhouses. Some greenhouse operations concentrate on importing tropical plants which are acclimatized to Alberta before they are sold. The most commonly grown greenhouse vegetables are cucumbers, tomatoes, and lettuce.

Greenhouses surveyed for the 1982-83 crop year could be divided into three groups on the basis of major crops. Ten greenhouses (40%) mainly produced long english cucumbers only. Four greenhouses (16%) produced hydroponic tomatoes. Eleven greenhouses (44%) produced bedding plants, potted and cut mums, poinsettias, foliage plants and roses. Greenhouses producing different crops were in operation year round whereas the vegetable greenhouses were in operation for about 10 months, i.e. February through November. Greenhouses producing bedding plants were in operation for about 5 months, February to the end of June.

Greenhouse Production

The only data available to indicate the value of greenhouse production in Alberta are the gross sales compiled by Statistics Canada by survey of the industry in Alberta. These sales amounted to $11.4 million in 1979, $15.7 million in 1980, $17.8 million in 1981 and $19.9 million in 1982 (Table 3). The number of firms reporting gross sales ranged from 92 to 105, which is significantly lower than the total number of greenhouses in the province. However, there is no other alternative to use in estimating greenhouse production in Alberta. The increase in

gross sales over the last four years could be attributed to higher prices received for produce sold and an increase in yield for various crops. During the last few years, some greenhouse operations have been diversified, i.e. producing more than one crop at the same time. The province is also experiencing a growing trend towards "hydroponic" production of tomatoes and lettuce.

Marketing of Greenhouse Produce

Greenhouse operators surveyed for the 1982-83 crop year used several marketing channels to market their produce. The most significant marketing channels are retail facilities owned by the greenhouse operators either attached to the greenhouses or located in cities and towns; other retail and wholesale facilities; the Co-op at Redcliff; and the farmers' markets in various centres.

Forty four per cent (11) of the greenhouse operators studied for the 1982-83 crop year produced flowers (roses and mums) poinsettias, bedding plants, foliage plants and selected vegetables. Eight of these operators owned retailing facilities which were attached to the greenhouse or located in the shopping centres; these facilities handled about 65 to 70 per cent of the produce; the remaining produce was shipped to wholesalers and retailers. The other three greenhouse operators from this group marketed 20 to 30 per cent of their produce at the gate and the balance was sold to wholesalers and retailers.

Fifty six per cent (14) of the greenhouses studied produced long english cucumbers, tomatoes and some bedding plants. Nine of these greenhouse operators produced cucumbers and were located in Redcliff and Medicine Hat. These producers marketed all of the produce through the Red Hat Co-op at Redcliff.[1] Producers pay a commission or fee set by the board of directors of the Co-op which covers grading, packaging, storage, distribution and administration costs of the produce received at the Co-op.

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(1) Red Hat Co-op is a producer organization responsible for the marketing of cucumbers grown in greenhouses in and around Medicine Hat.

Out of the remaining five greenhouse operators four produced hydroponic tomatoes only, and one produced bedding plants and tomatoes. About 90-95 per cent of the tomato production was marketed to wholesalers and retailers and the balance of 5-10 per cent was sold at the gate.

In north-central Alberta, greenhouse vegetable and bedding plant producers marketed 30 to 40 per cent of their produce at the gate and 60 to 70 per cent through rented stalls and booths in shopping centres and at the farmers' markets. The farmers markets have become popular marketing outlets especially during the bedding plant season throughout Alberta.

SECTION III

GREENHOUSE PRODUCTION COSTS AND RETURNS

Computation of Individual Cost Components

i) Interest on Investment

Interest is defined as a sum paid or calculated for the use of capital. The sum is usually expressed in terms of a rate or percentage of the capital involved, called the interest rate.

Interest rate is charged for the use of capital invested. Had the capital not been invested to buy a specific asset, it could have been utilized elsewhere either within or outside the firm, and would have brought some additional return to the firm.

A flat rate of 10 per cent was used for the purposes of this study to determine a fair return to land investment. The building and equipment interest rate was also calculated at 10 per cent. Interest applied on operating capital was the actual interest paid by the study participants.

ii) Depreciation

Depreciation is defined as the loss in value over time mainly as a result of obsolescence. In the case of buildings and equipment, it is that portion of the decrease in value resulting from ownership and the passage of time. Obviously, part of the reduced value of the buildings and equipment is the result of usage and is considered a variable cost. The entire depreciation has been considered a fixed cost.

In computing depreciation, a 10 per cent allowance or salvage value was taken from the purchase price of the buildings and equipment. The following formula was used in arriving at depreciation for buildings and equipment.

$$\text{Depreciation} = \frac{\text{Purchase Price} - \text{Salvage Value}}{\text{No. of Years of Life}}$$

iii) Land Value

Land associated with the greenhouse operation was valued at $1,700 per acre irrespective of its location. This value was determined through real estate values for good farmland suitable for a greenhouse operation. It can be argued that allocation of land value distorts the land value in and around urban areas relative to farmland. However, for uniformity and reasonable cost estimates, it was decided to standardize the land value regardless of its location. Researchers are aware that land values in cities or towns are much higher than $1,700 per acre but if market values are used for land acquired five or ten years ago, it would lead to artificially high fixed costs which would greatly inflate overall production costs.

Most of the greenhouse operators surveyed have been in the greenhouse business for quite some time with the exception of a few who got into the business four to five years ago. It should also be noted that the uniform land value was used to compute the average land value investment for all study participants.

iv) Property and Business Taxes

Taxes on real estate include payments on assessment of the greenhouse operations less any assessment for the greenhouse operator's residence or operations other than the greenhouse. There is a business tax for greenhouses located in urban municipalities. The exact amount of business tax was included in the costs.

v) Labour Costs

Hired labour costs included the amount of wages paid and any benefits received by the hired workers such as contributions to workers' compensation, canada pension plan and unemployment insurance.

The hours spent by the operator and his family in greenhouse production were estimated. An operator's labour was valued at $7.50 per hour and family labour was valued at a rate equal to that paid to hired labour or the actual amount paid to family members.

vi) Production Materials and Supplies

Production materials and supplies included purchase of cuttings, seed plants, fertilizers, chemicals, soils, vermiculite, perlite, peat moss, straw, peat pots and plastic. Costs for production materials and supplies were the actual figures provided by the study participants.

vii) Heating Costs

Almost all the greenhouse operators had reasonably accurate costs for heating the greenhouses with natural gas. Monthly bills were helpful in arriving at the total heating costs.

viii) Utility Costs

Utility costs included electricity, telephone and water. Where the utility bill was combined with the greenhouse operator's residence, the operator was asked to apportion the bill to arrive at total utility costs for the greenhouse operation.

ix) Transportation Expenses

Expenses for trucks or other vehicles owned by the greenhouse operators were apportioned according to use in greenhouse operations, and personal and leisure driving. Freight charges paid to commercial or private carriers for hauling greenhouse produce or supplies were included in the transportation expenses.

x) Maintenance Costs

Maintenance costs included repairs to greenhouse structures, boilers, heating equipment, tractors and all other machinery and equipment associated with the greenhouse operation.

xi) Miscellaneous Costs

These costs included legal and accounting fees, office supplies, bad debts, donations, membership fees, insurance costs and other costs incurred in a greenhouse operation but not reported under the above costs.

xii) Marketing Charges

Marketing charges were the actual amount paid by each greenhouse operator for having produce marketed through the co-op at Redcliff. These charges covered grading, packaging and commission fees. The charges paid by each grower were included as a cost item in the study.

Greenhouse Investment Costs By Regions

Greenhouse investment costs for the 1982-83 crop year were obtained directly from the study participants during the survey. Each operator was asked to value the greenhouse structure based on the current market costs or on replacement value. The study participants were also asked to provide an estimate of the life of the structure in order to calculate interest and depreciation costs.

Investment costs were calculated on land, buildings, machinery, automotives and other miscellaneous equipment. Rate of interest used for determining interest costs for land, buildings and equipment was 10 per cent. Details on average investment and investment costs for the greenhouses in Group I, Group II and the study sample are given in Table 5.

i) Land Investment

Average land area associated with the greenhouses, such as buildings (production area and office) and parking space, was 3.92 acres for Group I participants, 2.30 acres for Group II participants, and 2.88 acres for the study sample. Average land investments per greenhouse in Group I, Group II, and the study sample were $6579, $3909, and $4870, respectively.

Land investment cost (land interest) for each greenhouse averaged 2.0¢, 1.0¢ and 1.0¢ per square foot for the Group I, Group II and the study sample respectively.

ii) Building Investment

Average building investment based on the replacement value of the greenhouse facilities studied during the 1982-83 crop year was $334,896 per greenhouse in Group I, $143,501 per greenhouse in Group II, and $212,403 per greenhouse for the study sample. Average investment costs composed of interest and depreciation on buildings were $8173, $3342 and $5081 per greenhouse for greenhouses in Group I, Group II and the study sample. The corresponding investment costs per square foot of greenhouse were 104¢, 59¢, and 80¢ respectively.

iii) Equipment Investment

Average machinery investment based on the purchase price of the equipment was $24,183 per greenhouse for Group I, $35,721 for Group II, and $31,567 for the study sample. Average investment costs for machinery and equipment were 8¢, 15¢, and 12¢ per square foot for Group I, Group II, and the study sample, respectively. Details on investment and investment costs i.e. interest and depreciation on machinery and equipment are presented in Table 5.

iv) Automotive Investment

Average investment on automobiles was $16,564 per greenhouse for participants in Group I, $13,972 for Group II and $14,905 for the study sample. Average investment costs for automotive investment amounted to 7¢ per square foot each for Group I, Group II and the study sample.

v) Total Investment and Investment Costs

Average investment per greenhouse for the study participants in north and north-central Alberta (Group I) was $382,222 compared to

TABLE 5

AVERAGE INVESTMENT AND INVESTMENT COSTS FOR THE GREENHOUSES SURVEYED 1982-83

	Group I[1]	Group II[2]	Study Sample
Number Surveyed	9	16	25
Land Area (acres)	3.92	2.30	2.88
Land Value ($)	6578.89	3908.94	4870.12
Land Interest ($)	657.89	390.89	487.01
Land Interest Per Sq. Ft. ($)	0.02	0.01	0.01
Building Area (Sq. Ft.)	40197	31793	34818
Building Investment ($)	334896.00	143501.19	212403.31
Building Interest ($)	33489.58	14350.11	21240.32
Building Depreciation ($)	8173.10	3342.33	5081.39
Average Building Interest & Depreciation Per Sq. Ft. ($)	1.04	0.56	0.76
Equipment Investment ($)	24182.89	35720.69	31567.08
Equipment Interest ($)	2418.29	3572.07	3156.70
Equipment Depreciation ($)	992.21	1049.03	1028.57
Average Equipment Interest & Depreciation Per Sq. Ft. ($)	0.08	0.15	0.12
Automotive Investment ($)	16563.89	13971.75	14904.92
Automotive Interest ($)	1656.39	1397.17	1490.49
Automotive Depreciation ($)	1014.62	733.51	834.71
Average Automotive Interest & Depreciation Per Sq. Ft. ($)	0.07	0.07	0.07
Average Investment Per Greenhouse ($)	382221.62	197102.50	263745.37
Average Investment Per Sq. Ft. ($)	9.51	6.20	7.57
Average Investment Costs ($)	48402.04	24835.09	33319.19
Average Investment Costs Per Sq. Ft. ($)	1.20	0.78	0.96

(1) Group I represents north and north central regions (3, 4, 5 and 6).

(2) Group II represents south and south central regions (1 and 2).

$197,102 per greenhouse for the participants in south and south-central Alberta (Group II). Average investment for the study sample was $263,745 per greenhouse. Average investment per square foot of the greenhouse area was $9.51, $6.20 and $7.57 for Group I, Group II, and the study sample, respectively.

Average investment costs per greenhouse were $48,402 for Group I, $24,835 for Group II, and $33,319 for the study sample. Average investment costs per square foot ranged from 78¢ for Group II participants to 120¢ for greenhouse operators in Group I. Average investment costs for the study sample were 96¢ per square foot. Deatils on average investment and investment costs are provided in Table 5.

Greenhouse Operating Costs By Regions

Greenhouse operating costs include all costs incurred during the production of greenhouse crops. Some of the most common operating costs are hired labour, material inputs (seed, chemicals, and fertilizers), containers, greenhouse fuel, repairs, maintenance, power, water, property taxes and purchase of supplies. Average operating costs incurred in a greenhouse by region in 1982-83 are provided in Table 6. Out of all the operating cost items, hired labour costs were the highest at $52,771 for Group I, $37,916 for Group II, and $43,264 for the study sample. The second highest cost item was growing media, seed and cuttings which amounted to $43,568 for the study participants in Group I versus $21,389 for Group II participants; the average for the study sample was $29,374 per greenhouse. Fuel costs for the heating of greenhouses were at $35,914 for Group I, 2.24 times those of Group II ($16,051). Average greenhouse fuel costs for the study sample were at $23,202.

Greenhouses in north and north-central Alberta (Group I) reported average operating costs of $200,249 per greenhouse versus $153,360 in south and south-central Alberta (Group II). Average operating costs for the study sample amounted to $169,600 (Table 6). Average operating costs per square foot of the greenhouse area for Group I, Group II, and the study sample were $4.98, $4.79 and $4.87, respectively.

TABLE 6

AVERAGE GREENHOUSE OPERATING COSTS FOR THE GREENHOUSES SURVEYED, 1982-83

	Group I	Group II	Study Sample
Number Surveyed	9	16	25
GREENHOUSE AREA (SQ. FT.)	40197	31793	34818
GROSS REVENUE ($)	288932.62	180617.12	219610.69
Growing Media, Seed & Cuttings ($)	43568.22	21389.44	29373.80
Fertilizer and Chemicals	3513.67	4466.19	4123.28
Containers, Labels and Tags	13647.89	11201.81	12082.40
Hired Labour	52771.22	37916.12	43263.96
Depreciation[1]	10179.66	5124.68	6944.47
Greenhouse Fuel	35913.55	16051.44	23201.80
Utilities[2]	5707.22	3959.87	4588.92
Insurance and Registration Fees[3]	3597.11	2530.94	2914.76
Repairs and Maintenance[4]	12011.78	13815.62	13166.24
Freight Leasing and Express	4556.89	5916.81	5427.24
Property Taxes	1120.44	2230.56	1830.92
Business Taxes	138.89	21.38	63.68
Office Supplies	643.44	280.75	411.32
Advertising	3680.56	639.56	1734.32
Accounting and Legal	2236.67	1476.31	1750.04
Marketing Costs[5]	1100.00	8656.06	5935.88
Travel, Donations, Memberships	1194.44	1724.69	1533.80
Miscellaneous[6]	2097.22	2272.31	2209.28
Interest on Operating Capital	2570.89	12685.44	9044.20
AVERAGE OPERATING COSTS PER GREENHOUSE($)	200249.50	152359.81	169600.00
AVERAGE OPERATING COSTS PER SQ. FT. ($)	4.98	4.79	4.87

[1] Includes depreciation on buildings, equipment and transportation units.

[2] Includes power, water, telegram and telephone.

[3] Includes motor vehicles, greenhouse and labour insurance.

[4] Includes repair, maintenance and fuel expenses for equipment, buildings and motor vehicles.

[5] Includes commission and other marketing costs.

[6] Includes small tools, shop supplies, soil testing and promotional expenses other than advertising.

Production Costs And Returns By Regions

Results presented in Tables 6 and 7 show that the major costs in greenhouse operations were labour (hired, operator and family), followed by material inputs (cuttings, seed, fertilizers, chemicals, containers and labels), greenhouse fuel and utilities, repairs and maintenance. The relative shares of these production costs for the study sample were 34 per cent, 20 per cent, 12 per cent and 6 per cent respectively. Average fuel and utility costs per greenhouse operation in Group I was 15 per cent of total operating costs compared to 10 per cent for Group II greenhouses.

Production costs for the typical greenhouse surveyed for the 1982-83 crop year amounted to $230,468 or $6.62 per square foot. Production costs for greenhouses in north and north-central Alberta, Group I, were $281,415 compared to $201,810 for greenhouses in south and south-central Alberta, Group II. Correspondingly, average production costs per square foot were $7.00 and $6.35.

Average gross revenue per greenhouse studied in 1982-83 was $219,611 or $6.31 per square foot. Average gross revenue for Group I participants was $288,933 or $7.19 per square foot against $180,617 or $5.68 per square foot for Group II participants. Details of operating costs and production costs are provided in Table 7.

Average net greenhouse income and return over cash costs were positive for both groups of growers and the study sample. Average net greenhouse income ranged from $28,257 for Group II to $88,683 for Group I; the average for the study sample was $26,584. Returns over cash costs were lower in the south, Group II ($1.01 per square foot) than in the north, Group I ($1.55 per square foot). Average return over cash costs for the study sample was $1.19 per square foot.

Average return to management was positive for Group I participants and negative for Group II and the study sample. Return to management was only 19¢ per square foot for Group I, whereas it was negative by 67¢ and 31¢ for Group II and the study sample, respectively. Further details on costs and returns by regions and the study sample are presented in Table 7.

TABLE 7

COMPARISON OF COSTS AND RETURNS BETWEEN GROUP I, GROUP II, AND THE STUDY SAMPLE, 1982-83

	Group I	Group II	Study Sample
Number Surveyed	9	16	25
AVERAGE AREA (SQ. FT.)	40197	31793	34818
GROSS REVENUE ($)	288932.62	180617.12	219610.69
Gross Revenue Per Sq. Ft. ($)	7.19	5.68	6.31
OPERATING COSTS			
Material Inputs	60729.78	37057.44	45579.48
Hired Labour	52771.22	37916.12	43263.96
Greenhouse Fuel	35913.55	16051.44	23201.80
Utilities	5707.22	3959.87	4588.92
Insurance and Registration Fees	3597.11	2530.94	2914.76
Repairs and Maintenance	12011.78	13815.62	13166.24
Taxes	1259.33	2251.94	1894.60
Freight, Leasing and Express	4556.89	5916.81	5427.24
Advertising	3680.56	639.56	1734.32
Accounting and Legal	2236.67	1476.31	1750.04
Marketing Costs	1100.00	8656.06	5935.88
Miscellaneous[1]	3935.10	4277.75	4154.40
Depreciation	10179.66	5124.68	6944.47
Interest on Operating Capital	2570.89	12685.44	9044.20
TOTAL OPERATING COSTS	200249.50	152359.81	169600.00
OTHER COSTS			
Land, Building, Equipment Interest	38222.14	19710.25	26374.53
Operator's Labour	42943.11	29740.00	34493.12
TOTAL OTHER COSTS	81165.25	49450.25	60867.64
TOTAL PRODUCTION COSTS	281415.01	201810.06	230467.64
TOTAL PRODUCTION COSTS PER SQ. FT.	7.00	6.35	6.62
NET GREENHOUSE INCOME	88682.86	28257.31	50010.69
RETURN OVER CASH COSTS[2]	98862.52	33381.91	56955.16
RETURN OVER CASH COSTS PER SQ. FT.	2.46	1.05	1.64
RETURN TO MANAGEMENT	5717.61	(21192.94)	(10856.95)
RETURN TO MANAGEMENT PER SQ. FT.	0.19	(0.67)	(0.31)

[1] Includes small tools, shop supplies, soil testing, office supplies, donations, memberships, travel and promotional costs other than advertising.

[2] Total operating costs less depreciation.

Greenhouse Investment Costs For Greenhouses Producing Cucumbers

The study sample was divided into four categories by the type of crops produced. There were 10 greenhouses mainly producing cucumbers, 8 greenhouses producing bedding plants and other greenhouse crops with bedding plants being the major enterprises, four greenhouses producing hydroponic tomatoes and one each in poinsettias, mums and foliage plants. Two other greenhouses which reported on bedding plant operations were not included in the sample because of incomplete data.

Cucumber producing greenhouses were further divided into two groups by the type of growing media used. These were greenhouses which used soil and the other three used either pots or peat moss bags. The main reason for using pots was infestation of nematodes in the soil.

Average land area associated with the group of greenhouses producing cucumbers in soil was 1.24 acres and 1.18 acres for cucumbers grown in pots.

Average greenhouse area for cucumbers produced in soil and in pots was 26,721 square feet, and 21,500 square feet, respectively. Average area for both groups was 25,155 square feet.

Average building, equipment and automotive investment was $136,179 per greenhouse for cucumbers produced in soil and $108,792 per greenhouse for cucumbers produced in pots. Average investment for both groups of cucumbers amounted to $127,963 per greenhouse. Average investment costs for soil cucumbers was 64¢ per square foot compared to 65¢ per square foot for pot cucumbers. Details on average investment and investment costs for greenhouses using soil and pots for producing cucumbers are given in Table 8.

Operating Costs For Greenhouses Producing Cucumbers

As mentioned above, greenhouses producing cucumbers were divided into two groups by type of growing media used. Greenhouse fuel was the largest expense item for greenhouses producing cucumbers in pots followed by marketing costs, repairs and maintenance. Marketing costs were the largest cost item for greenhouses using soil for cucumber production.

TABLE 8 COMPARISON OF INVESTMENT AND INVESTMENT COSTS FOR GREENHOUSES PRODUCING CUCUMBERS, 1982-83

	Cucumbers (Soil)	Cucumbers (Pots)	Cucumbers (Soil and Pots)
Number Surveyed	7	3	10
Land Area (acres)	1.26	1.18	1.24
Land Value ($)	2146.86	2011.67	2106.30
Land Interest ($)	214.69	201.17	210.63
Land Interest Per Sq. Ft. ($)	0.01	0.01	0.01
Building Area (Sq. Ft.)	26721	21500	25155
Building Investment ($)	115531.37	76494.31	103820.25
Building Interest ($)	11553.14	7649.43	10382.02
Building Depreciation ($)	2763.35	2024.17	2541.59
Average Building Interest & Depreciation Per Sq. Ft. ($)	0.54	0.45	0.51
Equipment Investment ($)	13551.57	25785.66	17221.80
Equipment Interest ($)	1355.16	2578.56	1722.18
Equipment Depreciation ($)	412.10	873.68	550.58
Average Equipment Interest & Depreciation Per Sq. Ft. ($)	0.07	0.16	0.09
Automotive Investment ($)	4949.29	4500.00	4814.50
Automotive Interest ($)	494.93	450.00	481.45
Automotive Depreciation ($)	320.26	239.25	295.96
Average Automotive Interest & Depreciation Per Sq. Ft. ($)	0.03	0.03	0.03
Average Investment Per Greenhouse ($)	136179.06	108791.62	127962.75
Average Investment Per Sq. Ft. ($)	5.10	5.06	5.09
Average Investment Costs ($)	17113.61	14016.25	16184.39
Average Investment Costs Per Sq. Ft. ($)	0.64	0.65	0.64

The other major cost items for this group were greenhouse fuel, hired labour, and repairs and maintenance. Combined operating costs for both groups (soil and pots) showed marketing costs as the major expenditure, followed by greenhouse fuel, hired labour, and repairs and maintenance.

Average operating costs per greenhouse were $57,928 or $2.17 per square foot for the group of greenhouses producing cucumbers in soil, $47,578 or $2.21 per square foot for greenhouses producing cucumbers in pots. Average operating costs for both groups amounted to $54,823 or $2.18 per square foot. Details on individual operating cost items for greenhouses producing cucumbers by type of media used are given in Table 9.

Production Costs and Returns For Greenhouses Producing Cucumbers

Average gross revenue for the greenhouse operators using soil for producing cucumbers was $87,973 per greenhouse in 1982-83. Gross revenue per square foot of the greenhouse area was $3.29 for these greenhouses. For the greenhouses using pots for producing cucumbers, average gross revenue per greenhouse amounted to $66,324 or $3.08 per square foot. Average gross revenue for both groups was $81,478 or $3.24 per square foot.

Average production costs for cucumbers grown in soil were $97,698 per greenhouse or $3.66 per square foot of the greenhouse area. For the cucumbers grown in pots, average production costs per greenhouse in 1982-83 amounted to $82,519 or $3.84 per square foot. Average production costs for both groups when combined were $93,144 per greenhouse or $3.70 per square foot.

Average net greenhouse income was relatively higher for greenhouses producing cucumbers in soil than the greenhouses using pots for producing cucumbers. Net greenhouse income for the soil group was $30,046 per greenhouse compared to $18,746 for the pots group. Average net greenhouse income for both groups (combined) amounted to $26,656 per greenhouse. Average return over cash costs for both groups was positive at $1.26 per square foot for the soil group and $1.02 per square foot for

TABLE 9

COMPARISON OF OPERATING COSTS FOR GREENHOUSES PRODUCING CUCUMBERS, 1982-83

	Cucumbers (Soil)	Cucumbers (Pots)	Cucumbers (Soil and Pots)
Number Surveyed	7	3	10
GREENHOUSE AREA (SQ. FT.)	26721	21500	25155
GROSS REVENUE ($)	87973.12	66324.00	81478.37
Growing Media & Seed/Cuttings	1985.86	2200.67	2050.30
Fertilizer and Chemicals	2245.57	1882.00	2136.50
Containers, Labels and Tags	1671.43	1183.33	1525.00
Hired Labour	8893.71	1946.00	6809.40
Depreciation[1]	3495.72	3137.10	3388.13
Greenhouse Fuel	9284.57	10625.66	9686.90
Utilities[2]	1726.00	2064.67	1827.60
Insurance and Reg. Fees[3]	1818.71	1736.33	1794.00
Repairs and Maintenance[4]	5481.43	5633.33	5527.00
Freight Leasing and Express	130.43		91.30
Property Taxes	2205.57	2501.67	2294.40
Business Taxes	25.00	35.00	28.00
Office Supplies	20.71	374.67	126.90
Advertising	100.29		70.20
Accounting and Legal	518.14	775.67	595.40
Marketing Costs[5]	11368.86	10074.33	10980.50
Travel, Donations, Memberships	834.57	68.00	604.60
Miscellaneous[6]	383.57	66.33	288.40
Interest on Operating Capital	5737.43	3273.33	4998.20
AVERAGE OPERATING COSTS PER GREENHOUSE	57927.54	47578.08	54822.69
AVERAGE OPERATING COSTS PER SQ. FT.	2.17	2.21	2.18

1 Includes depreciation on buildings, equipment and transportation units.

2 Includes power, water, telegram and telephone.

3 Includes motor vehicles, greenhouse and labour insurance.

4 Includes repair, maintenance & fuel expenses for equip., bldgs. & motor vehicles.

5 Includes commission and other marketing costs.

6 Includes small tools, shop supplies, soil testing and promotional expenses other than advertising.

the pots group. However, returns to management were negative for both groups. For cucumbers produced in soil, return to management was negative by 37¢ per square foot, and for cucumbers produced in pots return to management was negative by 75¢ per square foot i.e. double compared with the former group.

The major costs for cucumber producing greenhouses were marketing costs (commission paid to the co-op for the sale of cucumbers), greenhouse fuel, repairs and maintenance, and interest on operating capital. Breakdown of all investment and operating costs for the two groups of greenhouses and the combination of two groups are presented in Table 10.

TABLE 10

COMPARISON OF COSTS AND RETURNS FOR GREENHOUSES PRODUCING CUCUMBERS, 1982-83

	Cucumbers (Soil)	Cucumbers (Pots)	Cucumbers (Soil & Pots)
Number Surveyed	7	3	10
GREENHOUSE AREA (SQ. FT.)	26721	21500	25155
GROSS REVENUE ($)	87973.12	66324.00	81478.37
Gross Revenue Per Sq. Ft. ($)	3.29	3.08	3.24
OPERATING COSTS			
Material Inputs	5902.81	5266.00	5711.80
Hired Labour	8893.71	1946.00	6809.40
Greenhouse Fuel	9284.57	10625.66	9686.90
Utilities	1726.00	2064.67	1827.60
Insurance and Registration Fees	1818.71	1736.33	1794.00
Repairs and Maintenance	5481.43	5633.33	5527.00
Taxes	2230.57	2536.67	2312.40
Freight, Leasing and Express	130.43		91.30
Accounting and Legal	518.14	775.67	595.40
Advertising	100.29		70.20
Marketing Costs	11368.86	10074.33	10980.50
Miscellaneous[1]	1238.85	509.00	1019.90
Depreciation	3495.72	3137.10	3388.13
Interest on Operating Capital	5737.43	3273.33	4998.20
TOTAL OPERATING COSTS	57927.54	47578.08	54822.69
OTHER COSTS			
Land, Building, Equipment Interest	13617.91	10979.16	12796.28
Operator's Labour	26152.43	24061.33	25525.10
TOTAL OTHER COSTS	39770.34	36040.49	38321.38
TOTAL PRODUCTION COSTS	97697.88	82518.56	93144.07
TOTAL PRODUCTION COSTS PER SQ. FT.	3.66	3.84	3.70
NET GREENHOUSE INCOME	30045.58	18745.92	26655.68
RETURN OVER CASH COSTS[2]	33541.30	21883.02	30043.81
RETURN OVER CASH COSTS PER SQ. FT.	1.26	1.02	1.20
RETURN TO MANAGEMENT	(9724.76)	(16194.54)	(11665.70)
RETURN TO MANAGEMENT PER SQ. FT.	(0.37)	(0.75)	(0.47)

[1] Includes small tools, shop supplies, soil testing, office supplies, donations, memberships, travel and promotional costs other than advertising.

[2] Total operating costs less depreciation.

Greenhouse Investment Costs By Crops Produced

As mentioned in the previous section, the study sample was divided into four categories by the types of crops produced. The study sample of 25 greenhouses when divided by types of crops produced, reported 10 greenhouses in cucumbers, 8 greenhouses in bedding plants, 5 in tomatoes and 4 greenhouses in potted mums. Two out of the 25 greenhouses reported more than one crop, therefore the number of greenhouses reported by types of crops produced is 27.

Average land area associated with the group of greenhouses producing bedding plants was 2.1 acres. Land area for the tomato producing group was 0.95 acres and 3.72 acres for the mums group. Average greenhouse area for the bedding plants group was 31,735 square feet compared with 10,802 square feet for the tomatoes group and 38,687 square feet for the mums group.

Average building, equipment and automotive investment amounted to $242,011 per greenhouse or $7.63 per square foot for the bedding plants group. Average investment per greenhouse of the tomatoes and mums groups was $74,255 ($6.87 per square foot) and $302,063 ($7.81 per square foot), respectively. In 1982-83 average investment costs for buildings, equipment and automotives were estimated at $31,218 or 98¢ per square foot for the bedding plants group, $9,443 or 87¢ per square foot for the tomatoes group, and $37,037 or 96¢ per square foot for the mums group. Details on average investment and investment costs by the types of crops produced are presented in Table 11.

Greenhouse Operating Costs By Crops Produced

Of all operating cost items, hired labour costs were the highest for the greenhouses producing bedding plants and mums, followed by growing media, seed/cuttings and greenhouse fuel. Other major expenditure items for these two groups were repairs and maintenance, freight, leasing and express, containers, labels and tags. Greenhouse fuel and hired labour were the major cost items for the greenhouse producing tomatoes.

TABLE 11 COMPARISON OF INVESTMENT AND INVESTMENT COSTS BY GREENHOUSE CROPS 1982-83

	Bedding Plants	Tomatoes	Mums
Number Surveyed	8	5	4
Land Area (acres)	2.10	0.95	3.72
Land Value ($)	3470.00	1615.00	6319.75
Land Interest ($)	347.00	161.50	631.97
Land Interest Per Sq. Ft. ($)	0.01	0.01	0.02
Building Area (Sq. Ft.)	31735	10802	38687
Building Investment ($)	200549.50	63020.00	246542.50
Building Interest ($)	20054.95	6302.00	24654.25
Building Depreciation ($)	5149.06	1478.55	5260.64
Average Building Interest & Depreciation Per Sq. Ft. ($)	0.79	0.72	0.77
Equipment Investment ($)	23998.62	6954.40	36141.25
Equipment Interest ($)	2399.86	695.44	3614.12
Equipment Depreciation ($)	969.93	371.09	923.34
Average Equipment Interest & Depreciation Per Sq. Ft. ($)	0.11	0.10	0.12
Automotive Investment ($)	13992.50	2665.20	13060.00
Automotive Interest ($)	1399.25	266.52	1306.00
Automotive Depreciation ($)	898.22	168.18	946.47
Average Automotive Interest & Depreciation Per Sq. Ft. ($)	0.07	0.04	0.05
Average Investment Per Greenhouse ($)	242010.62	74254.56	302063.25
Average Investment Per Sq. Ft. ($)	7.63	6.87	7.81
Average Investment Costs ($)	31218.23	9443.27	37036.80
Average Investment Costs Per Sq. Ft. ($)	0.98	0.87	0.96

Average operating costs for the greenhouse bedding plants group were $154,432 ($4.87 per square foot), $27,580 ($2.55 per square foot) for the tomatoes group and $237,913 ($6.15 per square foot) for the mums group. Details of operating costs for the three crop groups are provided in Table 12.

TABLE 12

COMPARISON OF OPERATING COSTS BY GREENHOUSE CROPS, 1982-83

	Bedding Plants	Tomatoes	Mums
Number Surveyed	8	5	4
GREENHOUSE AREA (SQ. FT.)	31735	10802	38687
GROSS REVENUE ($)	226261.75	31142.00	282466.25
Growing Media & Seed/Cuttings	35048.62	1372.60	36298.75
Fertilizer and Chemicals	2171.62	1707.60	7703.75
Containers, Labels and Tags	14078.87	1184.60	11680.00
Hired Labour	40924.00	4936.60	68879.50
Depreciation[1]	7016.99	2017.37	6830.23
Greenhouse Fuel	20917.00	7202.40	28337.50
Utilities[2]	4042.37	2473.80	5162.50
Insurance and Reg. Fees[3]	3360.25	299.20	3552.50
Repairs and Maintenance[4]	8221.62	2190.40	15075.75
Freight Leasing and Express	3073.37	57.60	13633.75
Property Taxes	1204.37	169.60	1037.00
Business Taxes	156.25		
Office Supplies	634.37	15.20	5119.50
Advertising	4079.37	7.00	949.25
Accounting and Legal	2243.75	310.00	2974.50
Marketing Costs[5]	1018.75	175.00	7500.00
Travel, Donations, Memberships	1151.87	111.00	2613.50
Miscellaneous[6]	2196.62	451.00	2356.75
Interest on Operating Capital	2892.25	2898.80	18208.25
AVERAGE OPERATING COSTS PER GREENHOUSE	154432.25	27579.73	237912.94
AVERAGE OPERATING COSTS PER SQ. FT.	4.87	2.55	6.15

1 Includes depreciation on buildings, equipment and transportation units.

2 Includes power, water, telegram and telephone.

3 Includes motor vehicles, greenhouse and labour insurance.

4 Includes repair, maintenance & fuel expenses for equip., bldgs. & motor vehicles.

5 Includes commission and other marketing costs.

6 Includes small tools, shop supplies, soil testing and promotional expenses other than advertising.

Greenhouse Production Costs And Returns By Crops Produced

Fifteen greenhouse operations from the study sample of 25 reported on production of bedding plants, tomatoes and mums. Two greenhouses reported more than one crop produced during the 1982-83 crop year. Therefore eight greenhouses provided data on bedding plants, five on tomatoes and four on mums.

Average gross revenue for the greenhouse operators producing mostly bedding plants was $226,262 per greenhouse in 1982-83. Gross revenue per square foot of the greenhouse area was $7.13 for these greenhouses. Average gross revenue for the tomatoes group was the lowest at $31,142 or $2.88 per square foot. Average gross revenue for the four greenhouses producing mums was $282,466 or $7.30 per square foot.

Average production costs for the bedding plants group were $218,737 per greenhouse or $6.89 per square foot. For the tomatoes and mums group, average production costs were $49,414 ($4.57 per square foot) and $286,094 ($7.40 per square foot), respectively.

Average net greenhouse income was considerably higher for the bedding plants group when compared to two other groups. Net greenhouse income for the bedding plants group was $71,829 per greenhouse, $3,563 and $44,553 for the tomatoes and mums groups, respectively. Average return over cash costs was positive for all three groups which ranged from a low of 52¢ per square foot for tomatoes to a high of $2.49 per square foot for the bedding plants. Average return to management was negative at $1.69 per square foot and 9¢ per square foot for tomatoes and mums, respectively. However, return to management for the bedding plants group was positive at 24¢ per square foot or $7,525 per greenhouse.

The most significant cost items for the above greenhouse operations were hired labour, material inputs, operator and family labour, greenhouse fuel, repairs and maintenance. Breakdown of all operating and investment costs for the greenhouses by crops produced is presented in Table 13.

TABLE 13

COMPARISON OF COSTS AND RETURNS BY GREENHOUSE CROPS, 1982-83

	Bedding Plants	Tomatoes	Mums
Number Surveyed	8	5	4
GREENHOUSE AREA (SQ. FT.)	31735	10802	38687
GROSS REVENUE ($)	226261.75	31142.40	282466.25
Gross Revenue Per Sq. Ft. ($)	7.13	2.88	7.30
OPERATING COSTS			
Material Inputs ($)	51299.11	4264.80	55682.50
Hired Labour	40924.00	4936.60	68879.50
Greenhouse Fuel	20917.00	7202.40	28337.50
Utilities	4042.37	2473.80	5162.50
Insurance and Registration Fees	3360.25	299.20	3552.50
Repairs and Maintenance	8221.62	2190.40	15075.75
Taxes	1360.62	169.60	1037.00
Freight, Leasing and Express	3073.37	57.60	13633.75
Accounting and Legal	2243.75	310.00	2975.20
Advertising	4079.37	7.00	949.25
Marketing Costs	1018.75	175.00	7500.00
Miscellaneous[1]	3982.86	577.20	10092.25
Depreciation	7016.99	2017.37	6830.23
Interest on Operating Capital	2892.25	2898.80	18208.25
TOTAL OPERATING COSTS	154432.25	27579.73	237912.94
OTHER COSTS			
Land, Building, Equipment Interest ($)	24201.05	7425.46	30206.34
Operator's Labour	40103.62	14408.40	17975.00
TOTAL OTHER COSTS ($)	64304.67	21833.86	48181.34
TOTAL PRODUCTION COSTS ($)	218736.92	49413.59	286094.28
TOTAL PRODUCTION COSTS PER SQ. FT. ($)	6.89	4.57	7.40
NET GREENHOUSE INCOME ($)	71829.50	3562.67	44553.31
RETURN OVER CASH COSTS[2] ($)	78846.49	5580.04	51383.54
RETURN OVER CASH COSTS PER SQ. FT. ($)	2.49	0.52	1.33
RETURN TO MANAGEMENT ($)	7524.83	(18271.19)	(3629.36)
RETURN TO MANAGEMENT PER SQ. FT. ($)	0.24	(1.69)	(0.09)

[1] Includes small tools, shop supplies, soil testing, office supplies, donations, memberships, travel and promotional costs other than advertising.

[2] Total operating costs less depreciation.

Greenhouse Investment Costs For Greenhouses Producing Combination Crops

The study sample of 25 greenhouses was divided into two main groups. One group included crops like bedding plants, foliage plants, mums, poinsettias and roses, and the other group included cucumbers and tomatoes. Two greenhouses reported more than one crop which was included in the respective crop groups thus increasing the total number of greenhouses in Tables 14, 15 and 16 to 27.

Average land area associated with the group of greenhouses producing a combination of crops, i.e., bedding plants and flowers was about 3.92 acres. Land area for the vegetable producing group was 1.14 acres. Average greenhouse area for the bedding plants and flowers group was 40,696 square feet compared to 20,371 square feet for the vegetable group.

Investment for buildings, equipment and automotives was considerably higher for the bedding plants, and flowers group when compared to the vegetable group. Building investment costs were 87¢ per square foot for the former group against 55¢ for the latter group. Equipment and automotive investment costs for the bedding plants and flowers group were 22¢ per square foot versus 12¢ per square foot for the vegetable group.

Average investment per greenhouse was $357,000 for the greenhouses producing bedding plants and flowers and $110,060 for the vegetables group. Average investment cost per square foot of greenhouse area for land, buildings, equipment and automotives were 111¢ and 68¢ for the bedding plants and flowers, and vegetable group, respectively. Details of investment and investment costs for greenhouses producing combination crops are presented in Table 14.

Greenhouse Operating Costs For Greenhouses Producing Combination Crops

As mentioned in the previous section, all greenhouses surveyed were divided into two groups by the types of crops produced to study the distribution of operating costs in 1982-83. Hired labour was the largest expense item for the group producing bedding plants and flowers as compared to the vegetable group. Growing media, seed and cuttings was the second largest expense item for the bedding plants group followed by

TABLE 14 AVERAGE INVESTMENT AND INVESTMENT COSTS FOR GREENHOUSES PRODUCING COMBINATION CROPS, 1982-83

	Bedding Plants, Foliage Plants, Mums Poinsettias, Roses	Vegetables (Cucumbers and Tomatoes)
Number Surveyed[1]	12	15
Land Area (acres)	3.92	1.14
Land Value ($)	6615.36	1942.53
Land Interest ($)	661.54	194.25
Land Interest Per Sq. Ft. ($)	0.02	0.01
Building Area (Sq. Ft.)	40696	20371
Building Investment ($)	285020.75	90220.53
Building Interest ($)	28502.07	9022.02
Building Depreciation ($)	6789.73	2187.24
Average Building Interest & Depreciation Per Sq. Ft. ($)	0.87	0.55
Equipment Investment ($)	41584.93	13799.33
Equipment Interest ($)	4158.49	1379.93
Equipment Depreciation ($)	1310.85	490.75
Average Equipment Interest & Depreciation Per Sq. Ft. ($)	0.13	0.09
Automotive Investment ($)	23779.43	4098.07
Automotive Interest ($)	2377.94	409.81
Automotive Depreciation ($)	1296.02	253.37
Average Automotive Interest & Depreciation Per Sq. Ft. ($)	0.09	0.03
Average Investment Per Greenhouse ($)	357000.50	110060.06
Average Investment Per Sq. Ft. ($)	8.77	5.40
Average Investment Costs ($)	45096.61	13937.34
Average Investment Costs Per Sq. Ft. ($)	1.11	0.68

(1) Two greenhouses reported more than one crop.

greenhouse fuel and repairs. Greenhouse fuel was the largest expense for the greenhouses in the vegetable group followed by marketing costs and hired labour. All other operating costs for the two groups of crops produced incurred in 1982-83 are listed in Table 15.

Average operating costs per greenhouse were $254,174 for the group of greenhouses producing bedding plants and flowers and $45,742 for the vegetables group. Average operating costs per square foot of the greenhouse area were $6.25 and $2.25 for the bedding plants and flowers, and the vegetable group, respectively.

Greenhouse Production Costs And Returns For Greenhouses Producing Combination Crops

Average gross revenue for the greenhouse operators producing mostly bedding plants and flowers was $324,588 per greenhouse in 1982-83. Gross revenue per square foot of the greenhouse area was $7.98 for these greenhouses. For the greenhouses producing mainly vegetables (cucumbers and tomatoes), average gross revenue per greenhouse was $64,700 or $3.18 per square foot.

Average production costs for the bedding plants and flowers group were $328,093 per greenhouse or $8.06 per square foot. For the vegetables group, average production costs amounted to $78,567 per greenhouse or $3.86 per square foot.

Average net greenhouse income was considerably higher for the crop combination group i.e. bedding plants and flowers than for the vegetables group. Net greenhouse income for the bedding plants and flowers group was $70,413 per greenhouse and $18,958 for the vegetable group. Average return over cash costs was positive for both groups. However, returns to management were negative by $3,506 for the bedding plants and flowers group, and by $13,867 for the vegetable group.

Average return over cash costs were $1.83 per square foot for the crop combination group, and $1.08 per square foot for the vegetables group. Details on operating costs, investment costs, total production costs, and returns over cash costs, and returns to management for both groups of crops are presented in Table 16.

TABLE 15

COMPARISON OF OPERATING COSTS FOR
GREENHOUSES PRODUCING COMBINATION CROPS, 1982-83

	Bedding Plants, Foliage Plants, Mums Poinsettias, Roses	Vegetables (Cucumbers and Tomatoes)
Number Surveyed	12	15
GREENHOUSE AREA (SQ. FT.)	40696	20371
GROSS REVENUE ($)	324587.69	64699.73
Growing Media & Seed/Cuttings	50498.83	1824.46
Fertilizer and Chemicals	5227.36	1993.53
Containers, Labels and Tags	15393.64	1411.53
Hired Labour	70701.62	6185.13
Depreciation[1]	9396.36	2931.21
Greenhouse Fuel	31940.79	8858.73
Utilities[2]	5948.14	2043.00
Insurance and Reg. Fees[3]	3815.64	1295.73
Repairs and Maintenance[4]	18782.21	4414.80
Freight Leasing and Express	9630.79	80.07
Property Taxes	1570.50	1586.13
Business Taxes	92.64	18.67
Office Supplies	5217.93	89.67
Advertising	3052.71	49.13
Accounting and Legal	2718.07	500.27
Marketing Costs[5]	2787.50	7378.66
Travel, Donations, Memberships	2274.29	440.07
Miscellaneous[6]	3580.86	342.60
Interest on Operating Capital	11544.90	4298.40
AVERAGE OPERATING COSTS PER GREENHOUSE	254174.50	45741.70
AVERAGE OPERATING COSTS PER SQ. FT.	6.25	2.25

1 Includes depreciation on buildings, equipment and transportation units.

2 Includes power, water, telegram and telephone.

3 Includes motor vehicles, greenhouse and labour insurance.

4 Includes repair, maintenance fuel expenses for equip., bldgs. & motor vehicles.

5 Includes commission and other marketing costs.

6 Includes small tools, shop supplies, soil testing and promotional expenses other than advertising.

TABLE 16

COMPARISON OF COSTS AND RETURNS BY GREENHOUSES PRODUCING COMBINATION CROPS, 1982-83

	Bedding Plants, Foliage Plants, Mums Poinsettias, Roses	Vegetables (Cucumbers and Tomatoes)
Number Surveyed	12	15
GREENHOUSE AREA (SQ. FT.)	40696	20371
GROSS REVENUE ($)	324587.69	64699.73
Gross Revenue Per Sq. Ft. ($)	7.98	3.18
OPERATING COSTS		
Material Inputs ($)	71119.93	5229.46
Hired Labour	70701.62	6185.13
Greenhouse Fuel	31940.79	8858.73
Utilities	5948.14	2043.00
Insurance and Registration Fees	3815.64	1295.73
Repairs and Maintenance	18782.21	4414.80
Taxes	1663.14	1604.80
Freight, Leasing and Express	9630.79	80.07
Accounting and Legal	2718.07	500.27
Advertising	3052.71	49.13
Marketing Costs	2785.50	7378.66
Miscellaneous[1]	11073.08	872.34
Depreciation	3996.36	2931.21
Interest on Operating Capital	11544.93	4298.40
TOTAL OPERATING COSTS	254174.50	45741.70
OTHER COSTS		
Land, Bldg., Equip. Interest ($)	35700.03	11006.00
Operator's Labour	38218.71	21819.53
TOTAL OTHER COSTS ($)	73918.74	32825.53
TOTAL PRODUCTION COSTS ($)	328093.31	78567.23
TOTAL PRODUCTION COSTS PER SQ. FT. ($)	8.06	3.86
NET GREENHOUSE INCOME ($)	70413.19	18958.03
RETURN OVER CASH COSTS[2] ($)	74409.55	21889.24
RETURN OVER CASH COSTS PER SQ. FT. ($)	1.83	1.08
RETURN TO MANAGEMENT ($)	(3505.95)	(13867.50)
RETURN TO MANAGEMENT PER SQ. FT. ($)	(0.09)	(0.68)

[1] Includes small tools, shop supplies, soil testing, office supplies, donations, memberships, travel and promotional costs other than advertising.

[2] Total operating costs less depreciation.

Greenhouse Investment Costs By Size Of Operation

The study sample was further divided into three groups according to the size of the operation. Seven (28%) greenhouses were placed in a group for which greenhouse area was up to 19,999 square feet; 13 (52%) in the 20,000 to 44,999 square foot range; and the remaining five (20%) were placed in the 45,000 square foot and over category. Average greenhouse area for the smallest class of greenhouses was 14,598 square feet; for the intermediate size of greenhouses 27,339 square feet; and 82,574 square feet for the largest greenhouses.

Average land area associated with a greenhouse was 1.00 acres for the group of greenhouses in the up to 19,999 square feet group, 1.97 acres for greenhouses in the 20,000 to 44,999 square foot category and 7.90 acres for the greenhouses with more than 45,000 square feet.

Average building and equipment investment costs were 76¢ per square foot for the smallest class of greenhouses (up to 19,999 square feet group) 58¢ and 116¢ per square foot for the intermediate size and the largest class of greenhouses, respectively. Average investment costs per greenhouse were $12,103 or 83¢ per square foot for the greenhouses in the up to 19,999 square feet group; $18,196 or 67¢ per square foot for the group of greenhouses in 20,000 to 44,999 square foot range; and $102,342 or 124¢ per square foot for the greenhouses in more than 45,000 square foot class. Details on average investment and investment costs by size of operation are presented in Table 17.

Greenhouse Operating Costs By Size Of Operation

Out of all operating cost items, hired labour costs were the highest for the largest group of greenhouses, followed by growing media, seed/cuttings, repairs and maintenance and greenhouse fuel. For the intermediate group of greenhouses, growing media, seed/cuttings were the largest operating cost items, followed by hired labour and greenhouse fuel. Growing media, seed/cuttings and greenhouse fuel were the largest operating cost items for the smallest group of greenhouses. Average operating costs per greenhouse were $49,824, $98,634 and $521,800 for the green-

TABLE 17

COMPARISON OF INVESTMENT AND INVESTMENT COSTS
BY SIZE OF OPERATION, 1982-83

	Up to 19,999 Sq. Ft.	20,000 to 44,999 Sq. Ft.	45,000 Sq. Ft. and Over	Study Sample
Number Surveyed	7	13	5	25
Land Area (acres)	1.00	1.97	7.90	2.88
Land Value ($)	1700.00	3284.85	13430.00	4870.12
Land Interest ($)	170.00	328.48	1343.00	487.01
Land Interest Per Sq. Ft. ($)	0.01	0.01	0.02	0.01
Building Area (Sq. Ft.)	14598	27339	82574	34818
Building Investment ($)	69939.25	99156.87	706293.56	212403.31
Building Interest ($)	6993.93	9915.69	70629.31	21240.32
Building Depreciation ($)	1671.21	2559.85	16411.72	5081.39
Average Building Interest & Depreciation Per Sq. Ft. ($)	0.59	0.46	1.05	0.76
Equipment Investment ($)	18012.57	25147.46	67234.37	31567.08
Equipment Interest ($)	1801.26	2514.75	6723.44	3156.70
Equipment Depreciation ($)	683.73	816.67	2063.30	1028.57
Average Equipment Interest & Depreciation Per Sq. Ft. ($)	0.17	0.12	0.11	0.12
Automotive Investment ($)	5082.29	12619.38	34599.00	14904.92
Automotive Interest ($)	508.23	1261.94	3459.90	1490.49
Automotive Depreciation ($)	274.54	798.67	1712.65	834.71
Average Automotive Interest & Depreciation Per Sq. Ft. ($)	0.05	0.08	0.06	0.07
Average Investment Per Greenhouse ($)	94734.12	140208.50	882557.00	263745.37
Average Investment Per Sq. Ft. ($)	6.49	5.13	9.95	7.57
Average Investment Costs ($)	12102.87	18196.02	102342.25	33319.19
Average Investment Costs Per Sq. Ft. ($)	0.83	0.67	1.24	0.96

houses in the up to 19,999 square foot category; 20,000 to 44,999 square feet; and 45,000 square feet and over groups, respectively. In terms of greenhouse operating costs per square foot, these costs were $3.41 for the smallest size group of greenhouses, $3.61 for the intermediate group, and $6.32 for the largest size class of greenhouses. Details of operating costs by size of operation are provided in Table 18.

Greenhouse Production Costs And Returns By Size Of Operation

As mentioned above, the study sample was divided into three groups according to the size of operation. The average area for the smallest size class of greenhouses was 14,598 square feet, the average for the intermediate size was 27,339 square feet, and for the largest size of greenhouses average area was 82,574 square feet.

Average production costs per greenhouse were $83,408 for the greenhouses in the up to 19,999 square foot group, $145,693 per greenhouse for the greenhouses in 20,000 to 44,999 square foot class, and $656,765 per greenhouse for the largest category of greenhouses. However, average production costs per square foot were the lowest for the intermediate size greenhouses at $5.33, compared to $5.71 for the smallest size group of greenhouses and $7.95 per square foot for the largest size group of greenhouses. Average gross revenue for the small greenhouses was $65,336 or $4.48 per square foot of the greenhouse area. For the greenhouses in 20,000 to 44,999 square foot class, average gross revenue was $125,057 or $4.57. For the third category of greenhouses, i.e., 45,000 square feet and over, average gross revenue was $681,393 per greenhouse or $8.25 per square foot (Table 19).

Greenhouses with 45,000 square feet and over showed the highest return over cash costs, $2.18 per square foot, followed by the smallest class of greenhouses i.e., up to 19,999 square feet class at $1.25 per square foot, and $1.19 per square foot for the greenhouses in 20,000 to 44,999 square feet category. Average retrun over cash costs for the study sample was $1.64 per square foot.

TABLE 18

COMPARISON OF OPERATING COSTS BY SIZE OF OPERATION, 1982-83

	Up to 19,999 Sq. Ft.	20,000 to 44,999 Sq. Ft.	45,000 Sq. Ft. and Over	Study Sample
Number Surveyed	7	13	5	25
GREENHOUSE AREA (SQ. FT.)	14598	27339	82574	34818
GROSS REVENUE ($)	65366.43	125056.69	681393.19	219610.69
Growing Media & Seed/Cuttings ($)	10150.00	21488.61	76788.56	29373.80
Fertilizer and Chemicals	1683.86	2123.54	12737.80	4123.28
Containers, Labels and Tags	1753.29	7075.54	39561.00	12082.40
Hired Labour	5289.71	16266.07	166622.37	43263.96
Depreciation[1]	2629.17	4175.05	20186.46	6944.47
Greenhouse Fuel	8991.71	13732.61	67715.75	23201.80
Utilities[2]	2892.29	2997.69	11101.40	4588.92
Insurance and Reg. Fees[3]	1005.43	1914.15	8189.40	2914.76
Repairs and Maintenance[4]	3881.86	7467.54	40981.00	13166.24
Freight Leasing and Express	155.43	1978.08	21775.60	5427.24
Property Taxes	975.00	1701.31	3366.20	1830.92
Business Taxes	17.14	106.69	17.00	63.68
Office Supplies	109.71	408.85	840.00	411.32
Advertising	21.43	2116.77	3138.00	1734.32
Accounting and Legal	462.14	887.08	5796.80	1750.04
Marketing Costs[5]	3119.43	6196.38	9201.60	5935.88
Travel, Donations, Memberships	548.43	698.46	5085.20	1533.80
Miscellaneous[6]	612.00	1280.08	6861.40	2209.28
Interest on Operating Capital	5525.57	6019.38	21834.80	9044.20
AVERAGE OPERATING COSTS PER GREENHOUSE ($)	49823.56	98633.75	521800.00	169600.00
AVERAGE OPERATING COSTS PER SQ. FT. ($)	3.41	3.61	6.32	4.87

1 Includes depreciation on buildings, equipment and transportation units.

2 Includes power, water, telegram and telephone.

3 Includes motor vehicles, greenhouse and labour insurance.

4 Includes repair, maintenance and fuel expenses for equipment, buildings and motor vehicles.

5 Includes commission and other marketing costs.

6 Includes small tools, shop supplies, soil testing and promotional expenses other than advertising.

TABLE 19

COMPARISON OF COSTS AND RETURNS BY SIZE OF OPERATION, 1982-83

	Up to 19,999 Sq. Ft.	20,000 to 44,999 Sq. Ft.	45,000 Sq. Ft. and Over	Study Sample
Number Surveyed	7	13	5	25
Average Area (Sq. Ft.)	14598	27339	82574	34818
GROSS REVENUE ($)	65336.43	125056.69	681393.19	219610.69
GROSS REVENUE PER SQ. FT. ($)	4.48	4.57	8.25	6.31
OPERATING COSTS				
Material Inputs ($)	13587.15	30687.69	129087.36	45579.48
Hired Labour	5289.71	16266.07	166622.37	43263.96
Greenhouse Fuel	8991.71	13732.61	67715.75	23201.80
Utilities	2892.29	2997.69	11101.40	4588.92
Insurance and Registration Fees	1005.43	1914.15	8189.40	2914.76
Repairs and Maintenance	3881.86	7467.54	40981.00	13166.24
Taxes	992.14	1808.00	3383.20	1894.60
Freight, Leasing and Express	155.43	1978.08	21775.60	5427.24
Accounting and Legal	462.14	887.08	5796.80	1734.32
Advertising	21.41	2116.77	3138.00	1750.04
Marketing Costs	3119.43	6196.38	9201.60	5935.88
Miscellaneous[1]	1270.14	2387.39	12786.26	4154.40
Depreciation	2629.17	4175.05	20186.46	6944.47
Interest on Operating Capital	5525.57	6019.38	21834.80	9044.20
TOTAL OPERATING COSTS	49823.56	98633.75	521800.00	169600.00
OTHER COSTS				
Land, Building, Equipment Interest ($)	9473.41	14020.86	82155.62	26374.53
Operator's Labour	24111.14	33038.77	52809.20	34493.12
TOTAL OTHER COSTS ($)	33584.55	47059.63	134964.82	60867.64
TOTAL PRODUCTION COSTS ($)	83408.11	145693.38	656764.82	230467.64
TOTAL PRODUCTION COSTS PER SQ. FT. ($)	5.71	5.33	7.95	6.62
NET GREENHOUSE INCOME ($)	15542.87	26422.94	159593.19	50010.69
RETURN OVER CASH COSTS[2] ($)	18172.04	32442.32	179779.65	56955.16
RETURN OVER CASH COSTS PER SQ. FT. ($)	1.25	1.19	2.18	1.64
RETURN TO MANAGEMENT ($)	(18041.68)	(20636.69)	24628.37	(10856.95)
RETURN TO MANAGEMENT PER SQ. FT. ($)	(1.24)	(0.75)	0.30	(0.31)

[1] Includes small tools, shop supplies, soil testing, office supplies, donations, memberships, travel and promotional costs other than advertising.

[2] Total operating costs less depreciation.

Average return to management for the study sample was negative at 30¢ per square foot or $10,857 per greenhouse. Only greenhouses in 45,000 square feet and over class showed positive return to management of $24,628 per greenhouse or 30¢ per square foot whereas the other two groups of greenhouses, the smallest and the intermediate, showed negative returns to management of $1.24 and 75¢ per square foot, respectively. Details regarding average gross revenue, operating costs, other costs and return over cash costs and return to management for the three size classes of greenhouse operations are given in Table 19.

Comparison Of Costs And Returns Between The Study Sample And Your Greenhouse

The information in Table 20 will be of particular significance to the study participants as it provides on opportunity for each greenhouse operator to compare his/her results with those of the study sample. Table 20 lists average costs and return data for the study sample only and a column has been left blank for the personal use of the study participant. Each study participant received a personalized report on his 1982-83 greenhouse operation along with the results for the study sample divided into regions, by type of crops produced, and by size of greenhouse operations.

TABLE 20

COMPARISON OF COSTS AND RETURNS BETWEEN THE STUDY SAMPLE AND YOUR GREENHOUSE

	Study Sample	Your Greenhouse
Number Surveyed	25	-
AVERAGE AREA (SQ. FT.)	34818	-
GROSS REVENUE ($)	219610.69	-
Gross Revenue Per Sq. Ft. ($)	6.31	-
OPERATING COSTS		
Material Inputs	45579.48	-
Hired Labour	43263.96	-
Greenhouse Fuel	23201.80	-
Utilities	4588.92	-
Insurance and Registration Fees	2914.76	-
Repairs and Maintenance	13166.24	-
Taxes	1894.60	-
Freight, Leasing and Express	5427.24	-
Advertising	1734.32	-
Accounting and Legal	1750.04	-
Marketing Costs	5935.88	-
Miscellaneous[1]	4154.40	-
Depreciation	6944.47	-
Interest on Operating Capital	9044.20	-
TOTAL OPERATING COSTS	169600.00	-
OTHER COSTS		
Land, Building, Equipment Interest	26374.53	-
Operator's Labour	34493.12	-
TOTAL OTHER COSTS	60867.64	-
TOTAL PRODUCTION COSTS	230467.64	-
TOTAL PRODUCTION COSTS PER SQ. FT.	6.62	-
NET GREENHOUSE INCOME	50010.69	-
RETURN OVER CASH COSTS[2]	56955.16	-
RETURN OVER CASH COSTS PER SQ. FT.	1.64	-
RETURN TO MANAGEMENT	(10856.95)	-
RETURN TO MANAGEMENT PER SQ. FT.	(0.31)	-

[1] Includes small tools, shop supplies, soil testing, office supplies, donations, memberships, travel and promotional costs other than advertising.

[2] Total operating costs less depreciation.

SECTION IV

COMPARISON BETWEEN 1979-80 AND 1982-83 GREENHOUSE STUDY RESULTS

It is difficult to compare the 1979-80 and 1982-83 surveys of the greenhouse industry because of the change in size of the sample and crop mix. However, a brief comparison of average costs and returns for the two study years is presented here for general information purposes. In the 1979-80 survey of the greenhouse industry, 50 greenhouse operators were selected and for the 1982-83 crop year survey 33 greenhouse operations were selected but only 25 operators provided the required information which could be used for analytical purposes. Although the size of sample in 1982-83 was half the size of sample in 1979-80, yet the data provided by these growers were considered representative of the industry, therefore an analysis was undertaken to document production costs and returns for the greenhouse industry in Alberta. The average greenhouse area for Group I and Group II participants in 1979-80 was 21,977 square feet and 26,837 square feet, respectively. Average area for the study sample in 1979-80 was 24,989 square feet. The average greenhouse area for Group I and Group II participants in the 1982-83 study was 40,197 square feet and 31,793 square feet, respectively. Greenhouse area for the 25 participants in the 1982-83 study averaged 34,818 square feet. Average gross revenue during the 1982-83 crop year was significantly higher than the 1979-80 crop year and the overall production costs and returns were also high.

The average greenhouse area for Group I participants in the 1982-83 study was almost double that of Group I participants in the 1979-80 study. The average area for 1982-83 Group II participants and the overall study sample were also considerably larger than they were for Group II participants and the study sample in 1979-80. With a considerable variation in size of the operations, a comparison between the two study years is made on gross revenue and production costs per square foot.

TABLE 21 COMPARISON BETWEEN 1979-80 AND 1982-83 GREENHOUSE STUDY RESULTS

	1979-80			1982-83		
	Group I	Group II	Study Sample	Group I	Group II	Study Sample
Number Surveyed	19	31	50	9	16	25
AVERAGE AREA (SQ. FT.)	21977	26836	24989	40197	31793	34818
GROSS REVENUE ($)	$91016.00	92954.00	93357.00	288932.62	180617.12	219610.69
Gross Revenue Per Sq. Ft. ($)	4.28	3.46	3.74	7.19	5.68	6.31
OPERATING COSTS						
Material Inputs	$19038.47	13857.00	15825.96	60729.78	37057.44	45579.48
Hired Labour	15138.84	17144.48	16363.74	52771.22	37916.12	43263.96
Greenhouse Fuel	6068.42	3577.57	4524.09	35913.55	16051.44	23201.80
Utilities	2659.84	1943.12	2215.47	5707.22	3959.87	4588.92
Insurance and Registration Fees	885.42	1453.19	1237.44	3597.11	2530.94	2914.76
Repairs and Maintenance	3421.84	6895.40	5575.45	12011.78	13815.62	13166.24
Taxes	759.48	2631.81	1920.32	1259.33	2251.94	1894.60
Freight, Leasing and Express	1052.79	1383.13	1257.60	4556.89	5916.81	5427.24
Advertising	821.21	432.13	579.98	3680.56	639.56	1734.32
Accounting and Legal	517.16	737.81	653.96	2236.67	1476.31	1750.04
Marketing Costs	162.74	3452.42	2202.34	1100.00	8656.06	5935.88
Miscellaneous[1]	1237.00	3395.71	2575.40	3935.10	4277.75	4154.40
Depreciation	3367.26	2988.72	3132.55	10179.66	5124.68	6944.47
Interest on Operating Capital	8269.55	8979.35	8709.62	2570.89	12685.44	9044.20
TOTAL OPERATING COSTS	$63399.89	68841.56	66773.56	200249.50	152359.81	169600.00
OTHER COSTS						
Land, Building, Equipment Interest	$13322.18	12627.81	12891.67	38222.14	19710.25	26374.53
Operator's Labour	16145.47	18686.93	17721.18	42943.11	29740.00	34493.12
TOTAL OTHER COSTS	$29467.65	31314.74	30612.85	81165.25	49450.25	60867.64
TOTAL PRODUCTION COSTS	$92867.54	100156.30	97386.41	281415.01	201810.06	230467.64
TOTAL PRODUCTION COSTS PER SQ. FT.	$ 4.23	3.73	3.90	7.00	6.35	6.62
NET GREENHOUSE INCOME	$30616.30	24112.13	26583.88	88682.86	28257.31	50010.69
RETURN OVER CASH COSTS[2]	$33983.56	27100.85	29716.43	98862.52	33381.91	56955.16
RETURN OVER CASH COSTS PER SQ. FT.	$ 1.55	1.01	1.19	2.46	1.05	1.64
RETURN TO MANAGEMENT	$ 1148.65	(7202.61)	(4028.97)	5717.61	(21192.94)	(10856.95)
RETURN TO MANAGEMENT PER SQ. FT.	$ 0.05	(0.27)	(0.16)	0.19	(0.67)	(0.31)

[1] Includes small tools, shop supplies, soil testing, office supplies, donations, memberships, travel and promotional costs other than advertising.

[2] Total operating costs less depreciation.

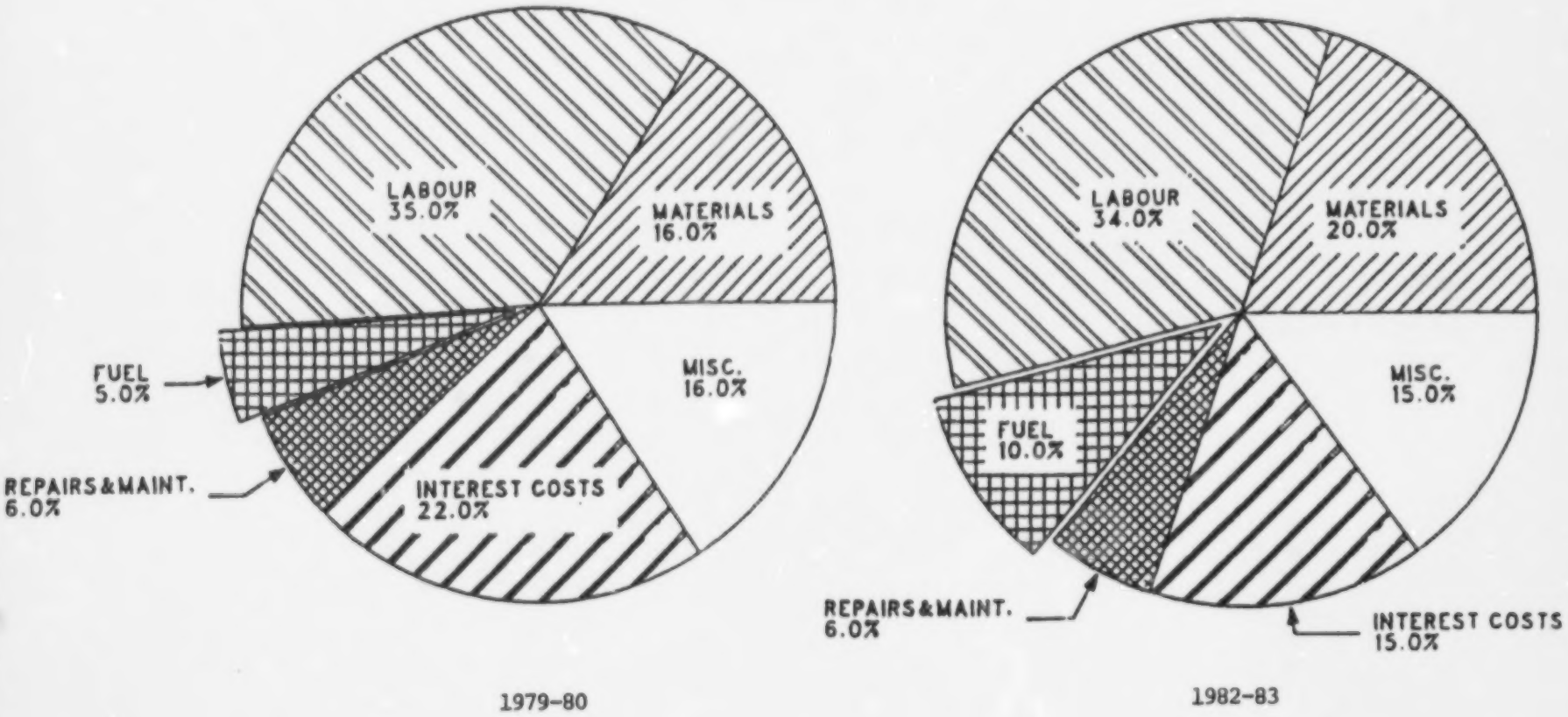

FIGURE 2: COMPARISON BETWEEN 1979-80 AND 1982-83 GREENHOUSE PRODUCTION COSTS

In 1982-83, average gross revenue for Group I, Group II and the study sample showed a considerable increase over the 1979-80 crop year. For example, gross revenue for the study sample in 1982-83 amounted to $6.31 per square foot versus $3.76 per square foot during the 1979-80 crop year. Similarly, total production costs increased significantly in the 1982-83 crop year compared to 1979-80 crop year.

Details regarding size of the sample, gross revenue, average operating costs, other costs, total production costs, net greenhouse income and return to management for the 1979-80 and 1982-83 crop years are presented in Table 21.

Figure 2 shows the distrubution of various cost components for the crop years 1979-80 and 1982-83. Material inputs (seed, cuttings, growing media, fertilizer, chemicals, containers, labels and tags) increased from 16 per cent in 1979-80 to 20 per cent in 1982-83. Labour costs (hired and operator) showed a marginal decline of 1 per cent during the 1982-83 crop year from 1979-80.

Greenhouse fuel (heating) costs which were about 5 per cent of the overall production costs in 1979-80 doubled during the 1982-83 crop year. Although the Primary Producers' Energy Rebate Program offset part of the increases in greenhouse heating costs the doubling of these costs considerably reduced the return to management. Greenhouse operators are concerned that if this program is withdrawn (program expires on December 31, 1984), they would not be able to keep their facilities in production during the winter months because of high heating costs.

Interest costs (operating & investment) showed a considerable decline from 22 per cent in 1979-80 to 15 per cent in 1982-83. During the crop year 1982-83, interest rates on operating capital and investment were lower than in 1979-80.

Miscellaneous costs (small tools, shop supplies, soil testing, office supplies, donations, memberships, travel and promotional costs other than advertising) decreased to 15 per cent in 1982-83 of the overall production costs from 16 per cent in 1979-80.

SECTION V

SUMMARY

Summary of Costs and Returns

This section provides summaries of the 1982-83 costs and returns information for the study sample by region, by types of crops grown in the greenhouses, and by the size of greenhouse operations. Twenty-seven greenhouse operators were surveyed to obtain the required data. Analysis in the report is based on 25 greenhouse operations as two greenhouses were not included because of inadequate information. However, individual analysis was completed for these two as well and results were sent to the participants for their review. The study participants provided detailed financial information on their 1982-83 crop year operation.

When the study sample was divided by region, there were 9 greenhouses (36%) in the north and north-central regions (Group I), and 16 greenhouses (64%) in the south and south-central regions. Distribution based on the types of crops produced showed 11 greenhouses (44%) producing mainly bedding plants, flowers (poinsettias, mums and roses), potted plants, foliage plants and a few selected vegetables. One out of 11 greenhouses also provided data on tomato production costs and returns which was included with the other four tomato producing greenhouses. Fourteen greenhouses, (56%) produced long-english cucumbers and tomatoes and of the 4 greenhouses produced hydroponic tomatoes. By size of operation, 7 greenhouses (28%) were in the up to 19,999 square feet category (an average area of 14,598 square feet), 13 greenhouses (52%) were in the range of 20,000 to 45,000 square feet, and the remaining 5 greenhouses (20%) were in the more than 45,000 square feet category.

The average production costs and returns for the 1982-83 crop year are summarized by region, crops produced, and the size of greenhouse operations in Table 22. The major production costs were material inputs, labour, and greenhouse fuel. The relative share of these costs of the

TABLE 22

SUMMARY OF GREENHOUSE PRODUCTION COSTS AND RETURNS, 1982-83

Items	By Regional Distribution			By Crops Produced		By Size of Operation		
	Study Sample	Group I	Group II	Bedding Plants & Flowers	Vegetables	up to 19,999 Sq. Ft.	20,000 to 44,999 Sq. Ft.	45,000 Sq. Ft. and Over
Number Surveyed	25	9	16	12	15	7	13	5
Average Area (Sq. Ft.)	34818	40197	31793	40696	20371	14598	27339	82574
Gross Revenue ($)	219610.69	288932.62	180617.12	324587.69	64699.73	65336.43	125056.69	681393.19
Gross Revenue/Sq. Ft. ($)	6.31	7.19	5.68	7.98	3.18	4.48	4.57	8.25
OPERATING COSTS								
Material Inputs	45579.48	60729.78	37057.44	71119.93	5229.46	13587.15	30687.69	129087.36
Hired Labour ($)	43263.96	52771.22	37916.12	70701.62	6185.13	5289.71	16266.07	166622.37
Greenhouse Fuel	23201.80	35913.55	16051.44	31940.79	8858.73	8991.71	13732.61	67715.64
Other Operating Costs	57554.76	50834.95	61334.81	80408.16	25468.38	21945.99	37947.38	158374.63
TOTAL OPERATING COSTS	169600.00	200249.50	152359.81	254170.50	45741.70	49823.56	98633.75	521800.00
Operating Costs/Sq. Ft. ($)	4.87	4.98	4.79	6.25	2.25	3.41	3.61	6.32
OTHER COSTS								
Land, Building, and Equipment Interest ($)	26374.53	38222.14	19710.25	35700.03	11006.00	9473.41	14020.86	82155.62
Operator's Labour ($)	34493.12	42943.11	29740.00	38218.71	21819.53	24111.14	33038.77	52809.20
TOTAL OTHER COSTS ($)	60867.64	81165.25	49450.25	73918.74	32825.53	33584.55	47059.63	134964.82
TOTAL PRODUCTION COSTS ($)	230467.64	281415.01	201810.06	328093.31	78567.23	83408.11	145693.38	656764.82
TOTAL PRODUCTION COSTS/SQ. FT. ($)	6.62	7.00	6.35	8.06	3.86	5.71	5.33	7.95
RETURN OVER CASH COSTS/SQ. FT. ($) (1)	1.64	2.46	1.05	1.83	1.08	1.25	1.19	2.18
RETURN TO MANAGEMENT/SQ. FT. ($)	(0.31)	0.19	(0.67)	(0.09)	(0.68)	(1.24)	(0.75)	0.30

Group I is North and North Central Regions (3, 4, 5 and 6).

Group II is South and South Central Regions (1 and 2).

(1) Total operating costs less depreciation.

total production costs for the study sample were 20 per cent, 19 per cent, and 10 per cent, respectively. Other significant cost items were maintenance and repairs, interest on operating capital and marketing costs.

Average production costs for a greenhouse operation during the 1982-83 crop year amounted to $230,465 or $6.62 per square foot with an estimated gross revenue of $219,611 per greenhouse or $6.31 per square foot. Average production costs and returns were higher for greenhouses in north and north-central Alberta (Group I), when compared to the greenhouses in south and south-central Alberta (Group II). Total production costs averaged $7.00 per square foot for Group I versus $6.35 per square foot for Group II. Gross revenue per square foot of the greenhouse area was $7.19 for Group I compared to $5.68 for Group II. Greenhouses in Group I showed higher returns over cash costs ($2.46 per square foot) than Group II greenhouses ($1.05 per square foot). Average return over cash costs for the study sample was $1.64 per square foot. Average return to management was positive at 19¢ per square foot for Group I greenhouses and negative by 67¢ per square foot for greenhouses in south and south-central Alberta (Group II). Average returns to management for the study sample were negative at 31¢ per square foot.

The greenhouses producing a combination crop showed substantially higher costs and net returns compared to greenhouses which only produced vegetables (cucumbers and tomatoes). Gross revenue for greenhouse operators producing combination crops was $7.98 per square foot and for the vegetable growers (cucumbers and tomatoes) gross revenue was estimated at $3.18 per square foot. Returns over cash costs for the bedding plant and flower growers were $1.83 per square foot compared to $1.08 per square foot for vegetable producers. Average return to management was negative for both groups at 9¢ per square foot for bedding plants and flowers group and 68¢ per square foot for the vegetables group. The above results indicate that diversified greenhouse operations i.e. producing more than one crop showed much better return over investment than single crop greenhouses.

Total production costs per square foot ranged from $5.33 for the intermediate size greenhouses to $7.95 for large greenhouses. In contrast, gross revenue averaged $8.25 per square foot for the large green-

houses, $4.57 per square foot for the intermediate size class and $4.48 per square foot for the small group of greenhouses. The highest return over cash costs ($2.18/sq. ft.) was among the largest greenhouses i.e. with an area in excess of 45,000 square feet. The group of small greenhouses showed relatively better return over cash costs ($1.25/sq. ft.) than the intermediate size class ($1.19/sq. ft). Return over cash cost for the study sample was $1.64 per square foot.

In terms of return to management (profit), only the large group of greenhouses showed a positive return to management. Estimated profit was $24,772 per greenhouse or 30¢ per square foot. The estimated return to management for the other two classes was negative at 75¢ per square foot for the intermediate size class and $1.24 per square foot for the small size of greenhouses. Return to management for the study sample was also negative at 31 cents per square foot.

Average operating and investment costs for the 1982-83 crop year have been summarized by regions, by crops produced, and by the size of operation and are presented in Table 22.

Summary of Findings

Findings of the study are as follows:

i) Greenhouses surveyed for this study showed a considerable variation in structure i.e. glass, fiber glass, and plastic. Structure of the greenhouses surveyed in the north and north central Alberta, consisted of plastic (42%), fiber glass (41%) and glass (17%). In the south and south-central regions, the greenhouse structures were glass at 53%, fiberglass at 26% and plastic 22%. Over the years, more fiberglass and plastic have been used in the construction of greenhouses. When both groups were combined, i.e. north/north-central regions and south/south-central regions, greenhouses for the study sample were 40 per cent glass, 31 per cent fiberglass, and 29 per cent plastic.

ii) The study results showed that overall costs and returns were much higher for the greenhouses in north/north-central Alberta when compared to the greenhouses in south/south-central Alberta. The

major reason for the higher costs and returns for Group I greenhouses could be diversification of the greenhouse operations thus incurring higher costs and receiving better prices for the produce.

iii) The results of the 1982-83 survey of the greenhouse industry revealed that greenhouses producing combination crops i.e. bedding plants, mums, poinsettias, and roses showed a much higher gross return, more than double the gross return for the vegetables group.

iv) Greenhouses in the north/north-central Alberta showed a profit of 19¢ per square foot whereas greenhouses in the south/south-central Alberta showed negative return of 67¢ per square foot.

v) Greenhouses with a larger production area and retailing facilities showed a positive return to management of 30¢ per square foot whereas the other two groups showed a negative return to management.

vi) The cost of energy, a major concern to greenhouse operators, amounted to 14 per cent of total operating costs for the study sample, 18 per cent for Group I participants (north and north-central Alberta) and about 11 per cent for Group II participants (south and central Alberta).

The Primary Producers' Energy Rebate Program was very much appreciated by all producers, as the assistance was very timely in reducing greenhouse heating costs. Some of the larger operations expressed concern regarding the maximum limit of the rebate. Several suggestions were made that rebate under this program be tied to the overall utilization of natural gas and that the program be continued beyond December 31, 1984.

vii) Greenhouse operators feel that government lending institutions still provide insufficient assistance for their industry which could be one of the factors limiting growth in Alberta.

viii) Availability of labour was not a problem anymore, as it had been during the 1978-79 or earlier crop years.

ix) Farmers' markets in cities and towns are serving a very useful purpose in the marketing of fresh greenhouse produce, especially bedding plants.